

CDTI Symbol Set: Principles for Rule-Sets dealing with interaction of Applications, Traffic Symbols and Traffic Data Quality (Apps + Symbols + Data Quality)

1. Any consistent set of rules for symbols is allowed
2. The rules must be simple
3. The rules must be applied consistently across all traffic applications
4. It should be simple, easy, and quick for the pilot to interpret the traffic display
5. The rules must be flexible to accommodate future growth to allow additional applications
6. Traffic applications, whether selected manually or automatically, should be clearly annunciated to the crew (except EVAcq which is always active)
7. Any selected and/or coupled targets and the applications performed on them should be clearly annunciated to the crew

One of the following rule sets can be applied to show different traffic symbols based on the data quality of traffic data (“good”, “degraded” and optionally “. The rule set chosen from below (or any rule set created based on the principles above) is expected to be stated as part of appropriate design and pilot training documents.

Rule-Set 1

1. Use EVAcq data quality for all symbols by default.
2. Exception 1: In ASSA/FAROA domain (subdomain of EVAcq), use ASSA/FAROA data quality requirements for symbols.
3. Exception 2: For traffic applications that require selection/coupling, use symbol based on that application’s data quality requirements for that selected/coupled target [when the running of the application is explicitly known to the automation and the pilot]
4. If rule 3 is in conflict with rule 2, use rule 3 till the traffic is on the ground, then use rule 2 (e.g., if EVApp selected target descends into ASSA/FAROA domain, use EVApp data quality requirements till target is on the ground, then use ASSA/FAROA data quality requirements).

Expand with example: Min of 2 symbols. See Notes 1 and 2.

Rule-Set 2:

1. Use EVAcq as the default application (at power up).
2. Have application specific view for each traffic application (selectable).

3. Each view uses “good”, “degraded” and “insufficient quality for the app, but sufficient for EVAcq” symbols as applicable
4. Symbols are removed from the display only if they don’t even meet EVAcq’s degraded data requirements (i.e., insufficient for EVAcq)

Expand with example: Min of 3 symbols.

Note 1: ASSA/FAROA traffic data quality requirements are used for traffic in ASSA/FAROA domain, only while own-ship is also in the ASSA/FAROA domain. (Definition of ASSA/FAROA domain is TBD, but will likely be “on-ground and close to ground in terminal area”).

Note 2: EVAcq and ASSA/FAROA are situational awareness applications. Since ASSA/FAROA involves airport surface map and the correlation of traffic data correlation with the airport surface map and hence the potential to show misleading traffic position information, the traffic data quality for ASSA/FAROA are more stringent than that for EVAcq. If the CDTI does not support the ASSA/FAROA applications (i.e., no capability exists to show runways and taxiways, or they are not displayed on purpose) EVAcq traffic data quality requirements can be applied everywhere and encompasses both surface and airborne targets, since there is no concern of showing misleading information due to lack of correlation of traffic with airport surface map elements (runways and taxiways).

Note: The rule set 1 implies that when own ship and traffic are in the ASSA/FAROA domain, traffic not meeting at least the degraded data quality for ASSA/FAROA is to be removed from the display. There was another school of thought that there may be value in showing such traffic on the display for general situational awareness (till the traffic data quality degrades to an unusable level for EVAcq). There was also concern that the crew may misinterpret such traffic (correlating it with the airport surface map elements) when the data quality is worse than that required for ASSA/FAROA degraded symbol. The rule set 2 provides a third symbol that allows the option of displaying such traffic.

Allow additional rule-sets?

Rule-Set 3:

1. Use the “good” data quality symbol to show traffic meeting data quality requirements of the most stringent of the currently possible traffic applications.
2. Use the “degraded” data quality symbol to show all other traffic that meets at least the EVAcq’s degraded data quality.

Note: The automation will need sufficient intelligence to know what the list of “currently possible” traffic applications (e.g., based on the supported applications, airspace the own ship and traffic are in, and other conditions).

Rule-Set 4:

1. Use the “good” data quality symbol to show traffic meeting the data quality requirements of the most stringent of the installed/supported traffic applications.
2. Use the “degraded” data quality symbol to show all other traffic that meets at least the EVAcq’s degraded data quality.
3. Exception 1: Only in the ASSA/FAROA domain (subdomain of EVAcq), use ASSA/FAROA data quality requirements for symbols.

Rule Set 5:Rephrase to be consistent.

1. Use traffic symbol A for equivalent NACp 9-11 (ASSA/FAROA/ASIA/ICSPA)
2. Use traffic symbol B for equivalent NACp 6-8 (EVApp)
3. Use traffic symbol C for NACp worse than 6, but still ok for EVAcq
4. Use Symbol A1 for ASSA/FAROA degraded data

Allow additional rule-sets?

The MOPS requirements are written generically to apply to the rule sets envisioned.

Notes: If other rule sets are used, it is possible that specific MOPS requirements may need to be modified to suit the rule set, but such modification should only be done when sufficient rationale exists to modify the requirement. <<FAA Cert. input needed.>>

Notes to incorporate later/SETHU.

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Symbol A : Data quality is GOOD
 Symbol B : Data quality is DEGRADED
 Symbol C : Data quality is only sufficient for EVAcq/SA

Some applications will require specific selection. Such selection can be manual or automatic. There are many different ways of designing the application and target selection and how they may work in practice.

One example sequence for manual application selection is

1. Pilot selects a target which is highlighted
2. A menu of possible applications shows the applications for which the target is qualified
3. Pilot selects the desired application (an arm/engage/coupling sequence may occur)
4. The automation applies the application criteria and displays the appropriate information so the application is performed; if the application's criteria are not/no longer met, shows the target as being unable to perform that application; target is more removed from the display as long as it still meets the situational awareness requirements

another example is

1. Pilot selects an application in a menu
2. The targets that meet that application's criteria are specifically indicated on the display (e.g., they all turn to a chevron symbol, rest of the targets being displayed differently)
3. Pilot selects a qualified target and appropriate information is displayed on it to allow the pilot to perform the application (an arm/engage/coupling sequence may occur when a target is selected)

another example is

1. The pilot sets up the automation for an application [e.g., provides it a FltID and selects an application (e.g., merging and spacing)]
2. When the right airplane is found and the right conditions are satisfied, the automation selects/highlights/couples the airplane target and provides the appropriate display parameters (e.g., speed guidance)]

an example for future ICSPA may use the following sequence

1. Pilot selects ICSPA
2. The automation identifies the partners (and potential partners) for ICSPA and checks their qualifications to perform ICSPA. If all's well, it indicates to the pilot that ICSPA may be performed. While doing ICSPA, it identifies the coupled target(s) to the pilot and provides the appropriate information on them. If all's not well, this fact is also indicated to the pilot